N91-14942

# INFRARED EMISSION FROM ULTRACOMPACT H II REGIONS

Ed Churchwell*, Mark Wolfire**, and Douglas O. S. Wood*

*Dept. of Astronomy, University of Wisconsin, 475 N. Charter St., Madison, WI 53706

**Dept. of Astron. & Astrophys., University of Chicago, 5640 S. Ellis, Chicago, IL 60637

Models of circumstellar dust shells around ultracompact (UC) HII regions have been constructed that accurately fit the observed infrared flux distributions. The models assume spherically symmetric dust shells illuminated by stars whose bolometric luminosity is inferred from the integrated FIR flux densities. Assuming ionization by a single zero-age main sequence (ZAMS) star, we use the relations of Panagia (1973) to infer the stellar radius and effective temperature for a given luminosity. The grain mixture in the dust shell consists of bare graphite and silicate grains with the optical properties of Draine and Lee (1984, 1987) and the size distribution of Mathis, Rumpl, and Nordsieck (1977). The computer code of Wolfire and Cassinelli (1986) was used to solve the radiative transfer equations through a spherical dust shell. The model provides monochromatic luminosities, dust temperatures, and opacities through the shell. Aside from the stellar properties ($L_*$, $R_*$, and $T_{eff}$) and dust properties, the only other input parameters to the model are the distance to the shell (used to convert fluxes to luminosities), the form of its density distribution $\rho(r)$, and its outer radius. All the latter input parameters have independent constraints which permit only a small range in their values for a given object. For example, the outer radius of the dust shell is determined by the point at which the dust temperature can no longer be distinguished from the ambient temperature of the molecular cloud. The inner radius of the dust shell is determined by the dust sublimation temperature (~1500 K for silicates and ~2000 K for graphite) and is not an input parameter. Because of the size distribution and different compositions of grains, the inner radius is different for different kinds of dust (i.e. the inner shell boundary is not very sharp).

Predictions of the model are compared with observations of a typical UC HII region and the run of dust temperature with radius and the optical depth with frequency are discussed. An important result of these models is the prediction that UC HII regions as a class are among the coolest and most luminous single objects in the Galaxy. They occupy an extreme position in FIR color-color plots and are therefore easily recognized.